

FORM PTO-1390
(REV 3/2001)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

**TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371**

DATE: June 8, 2001

EXPRESS MAIL LABEL NO.
EL483387626US

ATTORNEY DOCKET NO.
45237/DBP

U.S. APPLICATION NO.
09/857715

INTERNATIONAL APPLICATION NO
PCT/DE99/04028

INTERNATIONAL FILING DATE
December 10, 1999

PRIORITY DATE CLAIMED
December 10, 1998

TITLE OF INVENTION

**METHOD FOR SEPARATING IMAGE SEQUENCES STORED ON SUPPORTS SUCH AS MOTION-PICTURE
FILM, VIDEO TAPE OR SUCH LIKE**

APPLICANT(S) FOR DO/EO/US
BEUTLHAUSER, Roland

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2)).
 - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/LUS).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 13 to 20 below concern document(s) or other information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ **SMALL ENTITY** Assertion: Applicant(s) and any other associated with it/them under 37 CFR § 1.27(a) are a small entity.
20. ☒ Certificate of Mailing by Express Mail.
21. ☒ Other items or information: English Translation of Int'l. Appln & Annexes to the IPER Incorporated.

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531 Rec'd PCT 08 JUN 2001

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|--|--|--|--|---|--|
| U.S. APPLICATION NO. (If known, see 37 CFR 1.53) N/A | | INTERNATIONAL APPLICATION NO. PCT/DE99/04028 | | ATTORNEY DOCKET NO. 45237/DBP | |
|--|--|--|--|---|--|

| | | | | | |
|---|---------------------|---------------------|----------------|----------------|--------------|
| 21. The following fees are submitted: | | | | CALCULATIONS | PTO USE ONLY |
| <input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO: \$1,000.00 | | | | | |
| <input checked="" type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$860.00 | | | | | |
| <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00 | | | | | |
| <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00 | | | | | |
| <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00 | | | | | |
| ENTER APPROPRIATE BASIC FEE AMOUNT = | | | | \$ 860 | |
| Surcharge of \$130 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)). | | | | \$ | |
| Claims | Number Filed | Number Extra | Rate | | |
| Total Claims | 22+1 -20= | 3 | X \$18 | \$ 54 | |
| Independent Claims | 1 -3= | 0 | X \$80 | \$ | |
| Multiple dependent claim(s) (if applicable) | | | + \$270 | \$ 270 | |
| TOTAL OF ABOVE CALCULATIONS = | | | | \$ 1184 | |
| Reduction by 1/2 for filing by small entity, if applicable. Verified Small entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28). | | | | \$ | |
| SUBTOTAL = | | | | \$ 1184 | |
| Processing fee of \$130 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)). | | | | \$ | |
| TOTAL NATIONAL FEE = | | | | \$ 1184 | |
| Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property | | | | \$ | |
| TOTAL FEES ENCLOSED = | | | | \$ 1184 | |
| Note (1): The basic national fee must be paid when filing this application. The 20-month time limit (37 CFR § 1.494) and 30-month time limit (37 CFR § 1.495) are not extendable. | | | | Amount to be: | |
| | | | | refunded | \$ |
| | | | | charged | \$ |
| | | | | | |

a. ☒ A check in the amount of **\$ 1184.00** to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **03-1728**. A duplicate copy of this sheet is enclosed.

NOTE (2): Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

EXPRESS MAIL NO. EL483387626US

Applicant : Roland Beutlhauser
Application No. : N/A
Filed : June 8, 2001
Title : METHOD FOR SEPARATING IMAGE
SEQUENCES STORED ON SUPPORTS SUCH
AS MOTION-PICTURE FILM, VIDEO TAPE OR
SUCH LIKE
Docket No. : 45237/DBP/M521

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Post Office Box 7068
Pasadena, CA 91109-7068
June 8, 2001

Commissioner:

Please amend the above-identified application as follows:

IN THE SPECIFICATION

After the title please add the following:

--CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority of International application number PCT/DE99/04028, filed December 10, 1999, which in turn claims priority to German patent application number 198 59 087.3, filed December 10, 1998--.

IN THE CLAIMS

By this Amendment, Applicants are amending claims 5, 6, 10, 11, 12, 13, 14, 16, 19, 20, and 22. Pending claims 1 to 22 follow.

1. Method for separating image sequences stored on media such as motion-picture films, video tapes or such like into individual sequences, in which sequence changes of a second type

which are based on a change in the image content of successive images are detected and separation markers for the automatic separation of the image sequences into individual sequences are set,

characterized

in that in addition sequence changes of a first type in which the mean brightness of the current image exceeds or falls below a limit value calculated from a moving mean value of the image brightnesses of preceding images are detected, and in that separation markers of a first type are set for sequence changes of the first type and separation markers of a second type are set for sequence changes of the second type.

2. Method according to Claim 1, **characterized** in that the sequence changes of the first type comprise a predeterminable number of successive individual images of substantially the same brightness.
3. Method according to Claim 1, **characterized** in that the sequence changes of the second type comprise a predeterminable number of individual images having a substantially corresponding image content.
4. Method according to Claim 3, **characterized** in that a sequence change of the second type comprises an individual image whose content differs from the contents of preceding images by a predeterminable amount.
5. (Amended) Method according to claim 1, **characterized** in that the image sequences are digitized before the determination of sequence changes of the first and second types.
6. (Amended) Method according to claim 1, **characterized** in that the image sequences are firstly examined for separation markers of the first type and, in the absence of separation markers of the first type, are examined for separation markers of the second type.

7. Method according to Claim 6, **characterized** in that a provisional list of all possible separation markers is created, and in that post-processing is effected in order to determine the individual sequences.

8. Method according to Claim 7, **characterized** in that separation markers of the first type are treated with priority.

9. Method according to Claim 7 or 8, **characterized** in that separation markers of the second type which are situated within a predetermined distance from separation markers of the first type are discarded.

10. (Amended) Method according to claim 7, **characterized** in that separation markers of the second type are taken into account only if the preceding image sequence contains a predetermined number of individual images.

11. (Amended) Method according to claim 1, **characterized** in that separation markers which are based on image sequences which fall below a predetermined number of individual images are discarded.

12. (Amended) Method according to claim 1, **characterized** in that separation markers of the first type comprise a predetermined number of successive black or white images.

13. (Amended) Method according to claim 1 **characterized** in that the images identified as separation markers are themselves not stored, and in that the first image after the separation marker is the first image of the next image sequence.

14. (Amended) Method according to claim 1, **characterized** in that a moving mean value of the image brightnesses is calculated over a predetermined number of individual images and a lower and an upper peripheral value are determined from the moving mean value and a parameter for the response sensitivity of the separation markers of the first type, and in that a white separation marker is set if the mean value of the current image exceeds

the upper threshold value, and in that a black separation marker is set if the mean value of the current image falls below the lower threshold value.

15. Method according to Claim 14, **characterized** in that the mean values of the images identified as separation markers do not enter into the moving average.

16. (Amended) Method according to claim 1, **characterized** in that, in order to find separation markers of the second type between the current and the preceding image, the RMS deviation of the pixel brightnesses is calculated, in that a moving mean value of the RMS deviations is determined over a predeterminable number of preceding image changes and a threshold value is determined from a parameter specifying the response sensitivity for separation markers of the second type, and in that a separation marker is set if the RMS deviation of the current image change exceeds the threshold value.

17. Method according to Claim 16, **characterized** in that RMS deviations of separation markers of the second type enter into the moving mean value, but those of separation markers of the first type do not.

18. Method according to Claim 7, **characterized** in that in order to determine the individual sequences from the list of all possible separation markers there are discarded all separation marker sequences with separation markers of the first type which are shorter than the number of individual images which is necessary in order to set a separation marker of the first type, and in that there are discarded all separation markers of the second type which lie nearer to the remaining separation markers of the first type than the minimum number of images of a sequence which is necessary in order to be terminated by separation markers of the second type.

19. (Amended) Method according to claim 1, **characterized** in that a sequence starts with the first image of a file or with the first image after a separation marker of the first type or with a separation marker of the second type and ends with the last image of the file or with the last image before a separation marker of the first type, if it acquires at least the number

of individual images which is necessary in order to set a separation marker of the first type, or with the last image before a separation marker of the second type, if it contains at least the minimum number of images of a sequence which is necessary in order to be terminated by separation markers of the second type.

20. (Amended) Method according to claim 1, **characterized** in that a selected individual image, preferably the first individual image in each case, of an individual sequence is displayed as an icon on a monitor, and in that the individual sequence is started by clicking on the icon.

21. Method according to Claim 20, **characterized** in that a sequence of individual sequences is started for viewing by clicking on a plurality of icons.

22. (Amended) Use of the method according to claim 1 for automatically separating digitized films, in particular cardiological films, into individual sequences.

REMARKS

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

Respectfully submitted,

CHRISTIE, PARKER & HALE, LLP

By D. Bruce Prout
D. Bruce Prout
Reg. No. 20,958
626/795-9900

DBP/aam

VERSION WITH MARKINGS TO SHOW CHANGES MADE

5. (Amended) Method according to ~~at least one of the preceding claims~~ claim 1, **characterized** in that the image sequences are digitized before the determination of sequence changes of the first and second types.
6. (Amended) Method according to ~~at least one of the preceding claims~~ claim 1, **characterized** in that the image sequences are firstly examined for separation markers of the first type and, in the absence of separation markers of the first type, are examined for separation markers of the second type.
10. (Amended) Method according to ~~at least one of the preceding Claims 7 to 9~~ claim 7, **characterized** in that separation markers of the second type are taken into account only if the preceding image sequence contains a predetermined number of individual images.
11. (Amended) Method according to ~~at least one of the preceding claims~~ claim 1, **characterized** in that separation markers which are based on image sequences which fall below a predetermined number of individual images are discarded.
12. (Amended) Method according to ~~at least one of the preceding claims~~ claim 1, **characterized** in that separation markers of the first type comprise a predetermined number of successive black or white images.
13. (Amended) Method according to ~~at least one of the preceding claims~~ claim 1, **characterized** in that the images identified as separation markers are themselves not stored, and in that the first image after the separation marker is the first image of the next image sequence.
14. (Amended) Method according to ~~at least one of the preceding claims~~ claim 1, **characterized** in that a moving mean value of the image brightnesses is calculated over a predetermined number of individual images and a lower and an upper peripheral value are determined from the moving mean value and a parameter for the response sensitivity of the separation markers of the first type, and in that a white separation marker is set if the mean value of the current image exceeds the upper threshold value, and in that a black separation marker is set if the mean value of the current image falls below the lower threshold value.

16. (Amended) Method according to ~~at least one of the preceding claims~~ claim 1, **characterized** in that, in order to find separation markers of the second type between the current and the preceding image, the RMS deviation of the pixel brightnesses is calculated, in that a moving mean value of the RMS deviations is determined over a predeterminable number of preceding image changes and a threshold value is determined from a parameter specifying the response sensitivity for separation markers of the second type, and in that a separation marker is set if the RMS deviation of the current image change exceeds the threshold value.

19. (Amended) Method according to ~~at least one of the preceding claims~~ claim 1, **characterized** in that a sequence starts with the first image of a file or with the first image after a separation marker of the first type or with a separation marker of the second type and ends with the last image of the file or with the last image before a separation marker of the first type, if it acquires at least the number of individual images which is necessary in order to set a separation marker of the first type, or with the last image before a separation marker of the second type, if it contains at least the minimum number of images of a sequence which is necessary in order to be terminated by separation markers of the second type.

20. (Amended) Method according to ~~at least one of the preceding claims~~ claim 1, **characterized** in that a selected individual image, preferably the first individual image in each case, of an individual sequence is displayed as an icon on a monitor, and in that the individual sequence is started by clicking on the icon.

22. (Amended) Use of the method according to ~~at least one of the preceding claims~~ claim 1 for automatically separating digitized films, in particular cardiological films, into individual sequences.

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15

25 **Description**

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It is known to manually split successive scenes of a motion-picture film or video tape into individual sequences in order then to compile, discard or store these individual sequences, if appropriate in a different order. In this case, the

Replacement sheet**Page 2**

beginning of an individual sequence is usually initiated by an individual start image or a plurality
5 of start images, for example by the recording of a film clapperboard with the assignment noted thereon.

The image sequences may be contained on various recording media, such as motion-picture films, video
10 tapes, electronic storage media such as CDs or the like. In many applications, recording is effected in parallel on motion-picture films and an electronic storage medium, the electronically stored image sequence being reflected out of an optical beam path of
15 a motion-picture camera and being converted by means of a video chip or a video camera into video signals which are stored on the electronic storage medium.

US-A-5,537,530 discloses a method for separating image
20 sequences stored on video tapes into individual sequences, in which sequence changes of a first type which are based on a change in the mean brightness of successive images which exceed or fall below a predetermined amount and also sequence changes of a
25 second type which are based on a change in the image content of successive images are detected and separation markers for the automatic separation of the image sequences into individual sequences are set.

30 In numerous applications, automatic separation of, in particular, digitized films into individual sequences is desirable, without the need for manual separation or the recording of start images for introducing

Replacement sheet**Page 2a**

an individual sequence. In the medical field, in particular, such automatic separation of digitized
5 films into individual sequences is desirable in order that, directly after recording of the image sequences, individual sequences are made available for diagnosis. In this case, what is crucially important is that first
10 no images are lost during the automatic separation, and that secondly a high identification rate is achieved for resolving the image sequence into individual sequences.

It is an object of the present invention to specify a method for automatic separation, in particular of digitized motion-picture films, video recordings or such like, which guarantees a highest possible identification rate of the individual sequences and ensures that no images are lost during application of the separation method.

This object is achieved according to the invention by means of the features of Claim 1.

The solution according to the invention first guarantees a highest possible identification rate and secondly ensures the retention of all the images of the image sequences of a motion-picture film, video tape or such like.

The solution according to the invention is suitable in particular for realization in a data processing device with corresponding hardware components and can be used both for stand-alone applications and in network systems and also for remote data transmissions.

Advantageous refinements of the method according to the invention can be gathered from the features of the subclaims.

In the practical application, it proves to be advantageous to display a selected individual image, preferably the first individual image in each case, of an individual sequence as an icon on a monitor, so that the relevant individual sequence can be started by clicking on the icon. A sequence of individual sequences can be started for viewing by successively clicking on a plurality of icons.

The concept underlying the invention will be explained in more detail below using an exemplary embodiment.

For the application of the method according to the invention and of the software derived therefrom for automatically separating digitized cardiological films into individual sequences, 35 mm motion-picture films and S-VHS video tapes are used as media in the exemplary embodiment. A total of three types of sequence changes can be observed on these media:

1. On 35 mm motion-picture film (negative) two to three virtually white images, often up to three such sequence changes at short intervals (approximately three images) one after the other;
2. On video tape up to 30 virtually black images;
3. On video tape, at the end of the sequence, 10 to 15 - disregarding noise - identical individual images, then start of the next sequence without specially marked intermediate images.

The first two sequence changes are designated below as sequence changes of the first type, and the third sequence change as sequence change of the second type. These sequence changes of the first and second types are handled as follows:

- 30 Sequence changes of the first type which are based on a great change in the mean brightness can be identified very reliably; with good image material it is possible to achieve an identification rate of 100%.

The separation is effected by setting separation markers of first and second types or sequence changes of the first and second types. A separation marker of the first type is a predetermined number of successive black or white images. The images identified as separation markers are themselves not stored. The first image after the separation marker is also the first image of the next sequence. The sequences themselves must contain at least a predetermined number of images, otherwise they are discarded.

Sequence changes of the second type which are based on a change in the image content are significantly more difficult to identify since the size of the change varies and large deviations between successive images can occur even within a sequence. In many applications, only an identification rate of approximately 75% is achieved, i.e. not all sequence changes are identified as such and occasionally separation is performed within a sequence. It is guaranteed, however, that no images are lost.

The separation is effected according to the following rules:

- a) A separation marker of the second type is an image whose content differs greatly from the contents of the preceding images;
- b) Separation markers of the first type always have priority;

- 5
- c) Separation markers of the second type which are situated within a predetermined distance from separation markers of the first type are not taken into account;
 - d) Separation markers of the second type are not taken into account if the preceding sequence does not contain at least a predetermined number of images;
 - 10 e) The image identified as separation marker is the first image of the next image.

15 To set the behavior of the automatic separation method, the most important parameters - specified below - and also the following file names are set or specified in a file "splitter.ini":

- 20
- a) The parameter **MeanMinFrames** specifies the least number of images that must be contained in the individual sequences which are terminated by separation markers of the first type. Shorter sequences are discarded.

25 Since many films only contain very short sequences with the insertion of the patient's name (clapperboard), given an internal predetermined value of 12 and a range of values > 0 , a range of values for this parameter of 4 to 6 is recommended.

- 30
- b) The parameter **MeanSplttFrames** specifies the least number of images that a separation marker of the first type must comprise in order that separation is performed. The predetermined value is 2, the range of values is > 0 .

- c) The parameter **MeanSensitivity** indicates the response sensitivity for separation markers of the first type from low to high with a range of values from 0.0 to 1.0. The value 0.0 denotes no checking for this criterion. In order that the beginning of a new sequence whose brightness differs greatly from that of the preceding sequence can be reliably identified, this value must not, however, be too high. Within the range of values specified above, a range of values from 0.25 to 0.35 is recommended.
- d) The parameter **ChangeMinFrames** specifies the least number of individual images that must be contained in sequences which are terminated by separation markers of the second type. In the case of shorter sequences, the separation marker is discarded. Moreover, all separation markers of the second type are discarded which do not have at least this distance from separation markers of the first type. Preferably, the predetermined value is 12 given a range of values of > 0 .
- e) The parameter **ChangeSensitivity** indicates the response sensitivity for separation markers of the second type. Given a range of values from 0.0 to 1.0, where the value 0.0 denotes no checking for this criterion, the value 0.7 is recommended for average video material.
- f) The file **SpItDatpath** ("splitmarks.dat") indicates the file into which a list of separation markers is written. It is preferably valid only for a debug version of the program.

g) The file **SeqDatPath** ("sequences.dat") denotes the file in which the sequence list is stored unless a different file name was specified on the command line.

5

The automatic sequence separation can be activated separately for each video source in a set up window of a recording software. It is effected after the storage of the raw data on a hard disk and prior to further processing to form DICOM data records. In this case, the processing speed is approximately 500 to 1000 images per second. The complete path name of the program "splitter.exe" is entered as a parameter in the file VIM.IM of the recording software.

15

In a standard installation directory for the files "splitter.exe" and "splitter.ini", the following files are generated in accordance with the presetting:

20

1. A logging file "splitter.log";

2. A list of the separation markers "splitmarks.dat" for a debug version;

25

3. A list of the individual sequences "sequences.dat".

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In order to form the algorithm, each image is firstly examined with regard to separation markers of the first type. If no such marker is found, a search is made for separation markers of the second type. Once a provisional list for the possible separation markers has been created in this way, post-processing is effected in order to determine the individual sequences.

10 The function CheckSplitMean is used to find the separation markers of the first type. A moving mean value (MeanMean) of the image brightnesses is calculated in each case over the last 16 (MEANFRAMES) images. From said mean value and the parameter mean sensitivity, a lower (LThresh) and upper (UThresh) threshold value are determined as follows:

$$\text{LThresh} = \text{MeanSensitivity} * \text{MeanMean}$$

20 $\text{UTresh} = 255 - \text{MeanSensitivity} * (255 - \text{MeanMean})$

If the mean value of the current image exceeds UThresh, then a white separation marker (SPLT_WHITE) is set, and if it falls below LThresh, then a black separation marker (SPLT_BLACK) is set. In this case, the mean values of the separation marker images do not enter into the moving average.

30 The function CheckSplitChange is used to find separation markers of the second type by calculation of the RMS deviation (CurrRmsDiff) of the pixel brightnesses between the current image and the preceding image. A moving mean value (MeanRmsDiff) of the RMS deviations is determined over the last 16 (MEANFRAMES) image changes and from this and from the parameter ChangeSensitivity a threshold value (DiffThresh) is determined as follows:

DiffThresh = (8 - 6 * ChangeSensitivity) * MeanRmsDiff

If the RMS deviation of the current image change exceeds the threshold value, then a separation marker
5 (SPLT_CHANGE) is set. RMS deviations of separation markers of the second type enter into the moving mean value, but those of the first type do not.

The function EvaluateSplit is used to determine the
10 individual sequences from the separation marker list with the following proviso:

1. All separation marker sequences of the first type which are shorter than the number MeanSpltFrames of
15 images are discarded.
2. All separation markers of the second type which lie nearer to the remaining separation markers of the first type than ChangeMinFrames images are
20 discarded.

The individual sequences thus formed start

1. with the first image in the file or
25
 2. with the first image after a separation marker of the first type or
 3. with a separation marker of the second type3.
30
- and end

1. with the last image in the file or
2. with the last image before a separation marker of
the first type, if it is at least MeanMinFrames
5 images long, otherwise the sequence is discarded, or
3. with the last image before a separation marker of
the second type, if it is at least ChangeMinFrames
10 images long. Otherwise, the separation marker is
discarded.

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New Patent Claims

1. Method for separating image sequences stored on media such as motion-picture films, video tapes or such like into individual sequences, in which sequence changes of a second type which are based on a change in the image content of successive images are detected and separation markers for the automatic separation of the image sequences into individual sequences are set,
- characterized**
- in that in addition sequence changes of a first type in which the mean brightness of the current image exceeds or falls below a limit value calculated from a moving mean value of the image brightnesses of preceding images are detected, and in that separation markers of a first type are set for sequence changes of the first type and separation markers of a second type are set for sequence changes of the second type.
2. Method according to Claim 1, **characterized** in that the sequence changes of the first type comprise a predeterminable number of successive individual images of substantially the same brightness.
3. Method according to Claim 1, **characterized** in that the sequence changes of the second type comprise a predeterminable number of individual images having a substantially corresponding image content.

4. Method according to Claim 3, **characterized** in that
a sequence change of the second type comprises an
individual image whose content differs from the
contents of preceding images by a predeterminable
amount.
- 5.
5. Method according to at least one of the preceding
claims, **characterized** in that the image sequences
are digitized before the determination of sequence
changes of the first and second types.
- 10
6. Method according to at least one of the preceding
claims, **characterized** in that the image sequences
are firstly examined for separation markers of the
first type and, in the absence of separation
markers of the first type, are examined for
separation markers of the second type.
- 15
7. Method according to Claim 6, **characterized** in that
a provisional list of all possible separation
markers is created, and in that post-processing is
effected in order to determine the individual
sequences.
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8. Method according to Claim 7, **characterized** in that
separation markers of the first type are treated
with priority.
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9. Method according to Claim 7 or 8, **characterized** in
that separation markers of the second type which
are situated within a predetermined distance from
separation markers of the first type are
discarded.
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10. Method according to at least one of the preceding
Claims 7 to 9, **characterized** in that separation
markers of the second type are taken into account
only if the preceding image sequence contains a
predetermined number of individual images.
11. Method according to at least one of the preceding
claims, **characterized** in that separation markers
which are based on image sequences which fall
below a predetermined number of individual images
are discarded.
12. Method according to at least one of the preceding
claims, **characterized** in that separation markers
of the first type comprise a predetermined number
of successive black or white images.
13. Method according to at least one of the preceding
claims **characterized** in that the images identified
as separation markers are themselves not stored,
and in that the first image after the separation
marker is the first image of the next image
sequence.
14. Method according to at least one of the preceding
claims, **characterized** in that a moving mean value
of the image brightnesses is calculated over a
predetermined number of individual images and a
lower and an upper peripheral value are determined
from the moving mean value and a parameter for the
response sensitivity of the separation markers of
the first type, and in that a white separation
marker is set if the mean value of the current
image exceeds the upper threshold

value, and in that a black separation marker is set if the mean value of the current image falls below the lower threshold value.

- 5 15. Method according to Claim 14, **characterized** in that the mean values of the images identified as separation markers do not enter into the moving average.
- 10 16. Method according to at least one of the preceding claims, **characterized** in that, in order to find separation markers of the second type between the current and the preceding image, the RMS deviation of the pixel brightnesses is calculated, in that a
15 moving mean value of the RMS deviations is determined over a predeterminable number of preceding image changes and a threshold value is determined from a parameter specifying the response sensitivity for separation markers of the second type, and in that a separation marker is
20 set if the RMS deviation of the current image change exceeds the threshold value.
- 25 17. Method according to Claim 16, **characterized** in that RMS deviations of separation markers of the second type enter into the moving mean value, but those of separation markers of the first type do not.
- 30 18. Method according to Claim 7, **characterized** in that in order to determine the individual sequences from the list of all possible separation markers there are discarded all separation marker sequences with separation markers of the first
35 type which are shorter than the number of individual images which is necessary

in order to set a separation marker of the first type, and in

that there are discarded all separation markers of the second type which lie nearer to the remaining separation markers of the first type than the minimum number of images of a sequence which is necessary in order to be terminated by separation markers of the second type.

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19. Method according to at least one of the preceding claims, **characterized** in that a sequence starts with the first image of a file or with the first image after a separation marker of the first type or with a separation marker of the second type and ends with the last image of the file or with the last image before a separation marker of the first type, if it acquires at least the number of individual images which is necessary in order to set a separation marker of the first type, or with the last image before a separation marker of the second type, if it contains at least the minimum number of images of a sequence which is necessary in order to be terminated by separation markers of the second type.

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20. Method according to at least one of the preceding claims, **characterized** in that a selected individual image, preferably the first individual image in each case, of an individual sequence is displayed as an icon on a monitor, and in that the individual sequence is started by clicking on the icon.

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21. Method according to Claim 20, **characterized** in that a sequence of individual sequences is started for viewing by clicking on a plurality of icons.

22. Use of the method according to at least one of the preceding claims for automatically separating digitized films, in particular cardiological films, into individual sequences.

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

PATENT

Docket No.: 45237/DBPM521

As a below named inventor, I hereby declare that:

My residence, mailing address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **METHOD FOR SEPARATING IMAGE SEQUENCES STORED ON SUPPORTS SUCH AS MOTION-PICTURE FILM, VIDEO TAPE OR SUCH LIKE**, the specification of which is attached hereto unless the following is checked:

☒ was filed on December 10, 1999 as United States Application Number or PCT International Application Number PCT/DE99/04028 and was amended on 03 (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of the foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States of America, listed below and have also identified below, any foreign application for patent or inventor's certificate, or any PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

| <u>Application Number</u> | <u>Country</u> | <u>Filing Date (day/month/year)</u> | <u>Priority Claimed</u> |
|---------------------------|----------------|-------------------------------------|-------------------------|
| 198 59 087.3 | Germany | 10 December 1998 | YES |

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below

| <u>Application Number</u> | <u>Filing Date</u> |
|---------------------------|--------------------|
| 0 | 03 |

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claim of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. § 112.

| <u>Application Number</u> | <u>Filing Date</u> | <u>Patented/Pending/Abandoned</u> |
|---------------------------|--------------------|-----------------------------------|
|---------------------------|--------------------|-----------------------------------|

POWER OF ATTORNEY: I hereby appoint the following attorneys and agents of the law firm CHRIST PARKER & HALE, LLP to prosecute this application and any international application under the Patent Cooperation Treaty based on it and to transact all business in the U.S. Patent and Trademark Office connected

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**DECLARATION AND POWER OF ATTORNEY
FOR PATENT APPLICATION**

Docket No. 45237/DBP/M521

with either of them in accordance with instructions from the assignee of the entire interest in this application; or from the first or sole inventor named below in the event the application is not assigned; or from MAIROWSKI & NINNEMANN, in the event the power granted herein is for an application filed on behalf of a foreign attorney or agent.

| | | | | | |
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I declare that all statements made herein of my own knowledge are true and that all statements made of information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patents issued thereon.

**DECLARATION AND POWER OF ATTORNEY
FOR PATENT APPLICATION**

Docket No. 65287/DEP/0521

| | | | |
|--|--|---------------------|------------------------|
| NAME OF SOLE OR FIRST INVENTOR <u>Roland Brouhauser</u> | | | |
| X | Inventor's Signature <u>[Signature]</u> | Date 30 May 2001 | |
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